

Application No. 10/675,885  
After Final Office Action of January 11, 2007

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Docket No.: 59958(70301)

**REMARKS**

In the Office Action dated January 11, 2007, claims 12-24 are pending, claims 16-24 are withdrawn from consideration and claims 12-15 are rejected. Applicants request reconsideration at least for the reasons discussed hereinbelow.

Objection is made to the specification because of informalities at page 1, lines 1-2. The above amendment corrects the informalities.

Claim 12 has been amended to further clarify the function of the switching element. No new matter is added. The scope of the claim is not changed.

Claims 12-15 are rejected under 35 U.S.C. §103(a) over Mattes, et al. (US 5,876,767; "Mattes") in view of Friesem, et al. (US 6,850,544; "Friesem"). The examiner admits that Mattes fails to teach a beam expansion element or a switching element for changing the modal composition of the beam. Friesem is cited to make up for this deficiency.

However, Friesem also fails to teach or suggest a switching element which changes the modal composition of laser radiation between the first setting, in which the fundamental Gauss mode is emitted and higher order modes are suppressed, and a second setting, in which the radiation contains additional higher order modes and the overall power of radiation is increased.

Instead, Friesem describes the generation of a specific beam composition of an emitted laser beam of selected superimpositions of selected modes. However, this document **does not** disclose a switching element **that actually switches the mode composition** of the emitted laser beam **between a first setting and a second setting**. Friesem describes emitting of one specific mode composition, which can be either a single mode or a set of modes, but there is not even a hint of a suggestion for a switching element to switch between such modes.

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It is respectfully submitted that the presently claimed invention would not have been obvious to one of ordinary skill in the art in view of Mattes and Friesem.

Claims 12-15 are rejected under 35 U.S.C. §103(a) over Smith (US 6,391,245) in view of Friesem. The examiner admits that Smith fails to teach a beam expansion element or a switching element for changing the modal composition of the beam. Friesem is cited to provide for this deficiency. However, as discussed above, Friesem fails to teach or suggest a switching element which changes the modal composition of laser radiation between the first setting, in which the fundamental Gauss mode is emitted and higher order modes are suppressed, and a second setting, in which the radiation contains additional higher order modes and the overall power of radiation is increased.

Thus, it is respectfully submitted that the presently claimed invention would not have been obvious to one of ordinary skill in the art in view of Smith and Friesem.

Claims 12-15 are rejected under 35 U.S.C. §103(a) over Hirano, et al. (EP 0406513 A1; "Hirano") in view of Friesem. The examiner admits that Hirano *fails* to teach a switching element for changing the modal composition of the beam. Again, Friesem is cited to make up for this deficiency. As discussed above, Friesem *fails* to teach or suggest a switching element which changes the modal composition of laser radiation between the first setting, in which the fundamental Gauss mode is emitted and higher order modes are suppressed, and a second setting, in which the radiation contains additional higher order modes and the overall power of radiation is increased.

Thus, it is respectfully submitted that the presently claimed invention would not have been obvious to one of ordinary skill in the art in view of Hirano and Friesem.

Further, it is an objective of the present invention to provide a device for the layer-by-layer manufacture of a three-dimensional object which allows both, high dimensional accuracy and reduced hardening time. Applicants have discovered that this objective can be achieved by the device with a switching element as set forth in claim 12. In a first mode, a fundamental Gauss mode is emitted and higher order modes are suppressed. Thus, a focal point diameter is small and the accuracy is high (cf. first paragraph on page 4). In a second setting, the radiation contains

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additional higher order modes and the overall power of the radiation is increased. Surprisingly, due to the presence of additional higher order modes, the overall power is increased to such an extent that the achieved beam with a larger focal point diameter can be advanced more rapidly and the hardening time is reduced significantly (cf. second paragraph on page 5). Thus, **due to the switching element** changing the modal composition in this way, high resolution and high manufacturing speed can be achieved simultaneously.

None of Mattes, Smith and Hirano discloses changing modal compositions of laser radiation at all. Further, Fricsem only teaches controlling a specific beam composition of an emitted laser beam for selected superimpositions of selected single modes. However, this document **does not** disclose a switching element **that actually switches the mode composition** of the emitted laser beam **between a first setting and a second setting**. Fricsem describes emitting of one specific mode composition, which can be either a single mode or a set of modes, but there is not even a hint of a suggestion for a switching element to switch between such modes. there is no suggestion in Fricsem to change **the mode composition** of the emitted laser beam **between a first setting and a second setting**.

None of the cited prior art documents gives provides even a hint of a suggestion for a switching element which switches the modal composition such that, in a first setting, a fundamental Gauss mode is emitted with higher order modes suppressed and, in a second setting, the radiation contains additional higher order modes such that the overall power of the radiation is increased. Thus, none of the cited prior art documents gives any hint for the present invention and the surprising results obtained thereby.

Therefore, it is respectfully submitted that the presently claimed invention would not have been obvious to one of ordinary skill in the art in view of any combination of the cited art.

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In view of the above discussion, applicant believes the pending application is in condition for allowance.

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Respectfully submitted,

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